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N° 27

Communications du Laboratoire central à Christiania N° 4

V. WALFRID EKMAN

AN APPARATUS FOR THE COLLECTION OF BOTTOM-SAMPLES

WITH 5 FIGURES

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

AOUT 1905

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AN APPARATUS FOR THE COLLECTION OF BOTTOM-SAMPLES

BY

V. WALFRID EKMAN

WITH 5 FIGURES

The apparatus shown in Figs. 1—5 below, is designed for taking samples deep into the sea bottom. It is made according to F. L. EKMAN's principle[1]), although with some technical improvements.

The essential part of it is the steel collecting tube *a*, loaded near its upper end by a heavy lead weight *b*. An iron pipe *c* is attachable to the top of *a* by means of a bayonet-clutch *f*; it carries a fan *d* to keep the instrument upright in falling through the water. The line is fastened to the upper end of an iron rod *r* sliding freely inside *c* and prevented by the disc *e* (Fig. 4) from being pulled out of *c*. The collecting tube *a* is provided with a steel mouth-piece *m* at its lower end, and also with a valve at each end. The upper valve of leather (not shown in the figure) is attached to the end of *a* by a bayonet-clutch inside *f*; it allows water to escape from the tube but not to enter in the opposite direction. The lower valve consists of a pair of brass jaws *g* suspended below a 5 kg weight *h* which slides outside the collecting tube, and is initially suspended by a chain near the upper end of the latter. After the apparatus has been hung out the upper end of this chain is attached between the disc *e* and the catch *i*. When the apparatus hits the bottom, the iron rod *r* with the disc *e* drops down a few centimeters and lets go the chain (Fig. 4), the valve falls down the tube *a* — and into the mud if soft enough. The apparatus is then hauled up again; the jaws now rest on the upper edge of the mouth-piece and are held closed under it by the pressure of the 5 kg weight (see Fig. 5).

The collecting tube is lined inside with brass tubing *j* (Figs. 2 and 5) split longitudinally into two halves. When the apparatus has been hauled up full on to the deck, it is placed horizontally, and the lining taken out and parted; the sample remains then quite undisturbed

[1]) See: Den svenska hydrografiska expeditionen år 1877. Kongl. svenska Vet. Akad. Handlingar. Bd. XXV, No. 1. Stockholm, 1893.

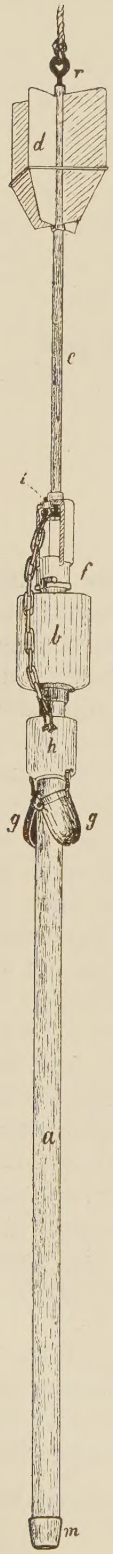

Fig. 1.

Fig. 2.

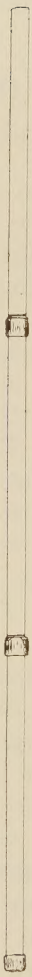

Fig. 3.

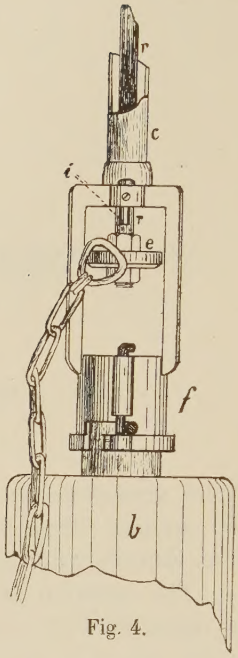

Fig. 4.

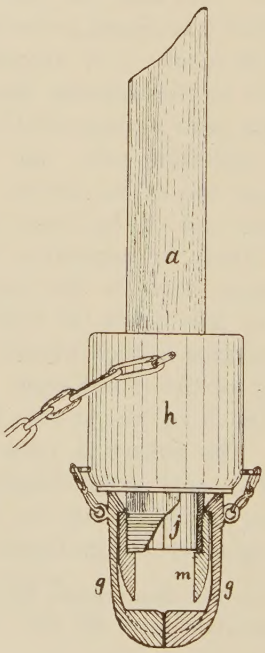

Fig. 5.

in one of the halves and may be directly examined or collected in glass vessels as desired.

Prof. NANSEN has with great success exchanged the brass lining for a number of suitably chosen glass tubes cut into two or three lengths (Fig. 3). Three short pieces of thin rubber tubing (bicycle tyres) are drawn on to three of the ends, so that the glass does not rest directly on glass or on the metal mouth-piece; with these simple precautions all danger of breaking the glass seems to be satisfactorily avoided. Having taken out the glass tubes, their ends are immediately covered up by sheet India-rubber; and in this way the samples are kept for future examination quite undisturbed and protected against the air. When the tube has been cleaned outside, the layers of the sample may be seen through the glass more clearly than in any other way. The expense of the glass-tubing is comparatively very small — indeed smaller than suitable glass-bottles would be.

The necessity of very great precautions against the oxidation of the samples has been clearly proved by some experiments, of which Dr. Fox will later on give a description. He found that in bottom samples which were freely exposed to the air, 1—8 % (depending on the degree of humidity etc. of the sample) of the amount of Ferrous Iron might pass into Ferric every 24 hours, and of two tubes filled with the same sample, one which had not been closed very tightly gave after 3 weeks twice as much Ferric Iron as the other one. It seems therefore that no conclusions at all can be drawn from the degree of oxidation of samples which have not been kept extremely well protected against the air.

The collecting tube is made of about 4 cm. inner diameter and 180 cm. long, and the whole instrument weighs about 40 kilograms; but the weight as well as the dimensions may of course be modified to suit special requirements. Prof. NANSEN has found that in soft bottoms, samples completely filling the whole length of the collecting tube can be taken. But as a rule the sample taken has not been longer than 1 m. although the apparatus had penetrated to its whole length into the bottom. If attention is not paid to this fact wrong ideas about the thickness of the different strata collected by the apparatus might easily be obtained (the thickness of the strata in situ being greater than in the sample). To get as correct an idea as possible of the thickness of the different strata it is therefore important to compare the total length of the sample taken, with the depth to which the apparatus has penetrated into the bottom. For this purpose there is made on the outside of the collecting tube and in the weight *b*, a series of holes which have to be cleaned before the apparatus is sent down, and examined again when it comes up. By letting down the apparatus successively at different

speeds so that it penetrates more or less deeply into the mud it would be possible in this way to get fairly correct information as to the thickness of the various strata even though they be of different degrees of softness.

The price of the apparatus (without glass-tubing) is about Kr. 135·00.

Professor NANSEN has suggested for consideration, the following rules for the examination of the bottom-samples:

1) The examination for the present should not be made too particular so as to take too much time.
2) Each stratum should be examined separately and as opportunity presents be subjected to
   a) Microscopical examination for Diatoms and Foraminifera.
   b) Mechanical examination of the size of the particles of which it consists.
   c) Chemical estimation of Carbonate and Lime, and
   d) of Ferrous and Ferric Iron.

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N° 10. G. O. Sars, On a new (Planktonic) Species of the Genus *Apherusa*. 4 p. With a plate. March 1904. Kr. 0,50.

N° 11. Martin Knudsen, σ_t Tabelle, Anhang zu den 1901 herausgegebenen hydrographischen Tabellen. 23 S. Mai 1904. Kr. 0,75.

N° 12. Catalogue des poissons du nord de l'Europe, avec les noms vulgaires dont on se sert dans les langues de cette région. 76 p. Juin 1904. Kr. 1.

N° 13A. Die Ostsee-Fischerei in ihrer jetzigen Lage. (Erster Teil).
I. Uebersicht über die Seefischerei in den dänischen Gewässern innerhalb Skagens. Im Auftrag von Dr. C. G. Joh. Petersen bearbeitet von Andreas Otterström.
II. Uebersicht über die Seefischerei Schwedens an den süd- und östlichen Küsten dieses Landes. Bearbeitet von Dr. Filip Trybom und Alf Wollebæk.
Zusammen 59 S. 6 Taf. Juni 1904. Kr. 1,50.

N° 14. E. van Everdingen und C. H. Wind, Oberflächentemperaturmessungen in der Nordsee. Vorläufige Mitteilung. Mit einer Tafel. Juli 1904. 10 S. Kr. 1.

N° 15—16. Sigurd Stenius, Ein Versuch zur Untersuchung der hydrographischen Veränderungen in der nördlichen Ostsee sowie im finnischen und im bottnischen Meerbusen. Vorläufige Mitteilung. Mit 5 Tafeln.
— — Graphische Berechnung von σ_t aus t und σ_0.
Zusammen 8 S. Oktober 1904.

N° 17. A. J. Robertson, Scottish hydrographic Research during 1903. 6 p. October 1904.

N° 18. J. W. Sandström, Einfluss des Winder auf die Dichte und die Bewegung des Meereswassers. 6 S. Oktober 1904.

N° 19. B. Helland-Hansen, Zur Ozeanographie des Nordmeeres. Resumé eines am 22. Juli gehaltenen Vortrags. Mit 3 Figuren im Text. 8 S. Oktober 1904.

N° 20. E. Ruppin, Ueber die Oxydierbarkeit des Meerwassers durch Kaliumpermanganat. 9 S. Oktober 1904.

N° 15—20. Ensemble 37 p. 5 pl. et 3 fig. Kr. 1,50.

N° 21. CHARLES J. J. FOX, On the Determination of the Atmospheric Gases Dissolved in Sea-Water. (Communications du Laboratoire central à Christiania N°. 1.) With one Plate and four Figures in the Text. 24 p. March 1905. Kr. 1.

N° 22. D. DAMAS, Notes biologiques sur les Copépodes de la mer norvégienne. Avec une carte. 24 p. Avril 1905. Kr. 1.

N° 23. V. WALFRID EKMAN, On the use of insulated Water-Bottles and Reversing Thermometers. (Communications du Laboratoire central à Christiania N°. 2.) With 2 Plates and 8 Figures in the Text. 28 p. April 1905. Kr. 1.

N° 24. V. WALFRID EKMAN, Kurze Beschreibung eines Propell-Strommessers. (Communications du Laboratoire central à Christiania N° 3.) Mit einer Tafel. 4 S. Juli 1905.

N° 25. O. PETTERSSON, Beschreibung des Bifilar-Strommessers. Mit einer Tafel. 6 S. Juli 1905.

N° 26. A. M. VAN ROSENDAAL UND C. H. WIND, Prüfung von Strommessern und Strommessungsversuche in der Nordsee. Mit zwei Tafeln. 10 S. Juli 1905.

N° 24—26. Zusammen 20 S. 4 Taf. Kr. 1.50.

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